

## **REMARKS**

Entry of the foregoing and reexamination and reconsideration of the subject application, as amended, pursuant to and consistent with 37 C.F.R. §1.112, are respectfully requested in light of the remarks that follow.

## **STATUS OF CLAIMS AND SUPPORT FOR AMENDMENTS**

Claims 30-34, 37 and 42-48 are now in this application. Claims 1-28 were previously cancelled, and claims 29, 35, 36 and 38-41 are cancelled by the present amendment. Claims 44-48 are newly added.

Claim 44 is now the only independent claim in the application. Claim 44 is drawn to the method of cancelled claim 40 or 41, but wherein the subject matter of previous claim 29 further includes the features of claims 32 and 33 as well as the feature of previous claim 36. In addition, the lower limit of the melting point of the matrix substrate is set at 50°C in accord with Example 1 and the upper limit is as in previous claim 34.

All of the remaining claims have been amended to be method claims depending, directly or indirectly, from new claim 44.

The features set forth as optional at the end of previous claims 29 and 34 are now made the subject matter of new claims 45 and 46, respectfully.

Previous claim 36 has been cancelled as redundant in light of the wording of new claim 44.

New claim 47 has basis at least on page 4, lines 26-27, of the as-filed specification.

New claim 48 has basis at least on page 4, lines 20-24, of the as-filed specification.

In view of the following, it is clear that no new matter has been introduced into the claims as a result of this amendment.

The invention as now claimed provides, in it broadest aspect, a method for reducing the number of microorganisms or the amount of scale in an industrial system, said method comprising the step of contacting the industrial system with an effective amount of a phosphonium compound embedded in a matrix substrate, wherein the phosphonium compound is selected from the group consisting of tris

(hydroxymethyl) phosphine (THP), a THP<sup>+</sup> salt (tetrakis (hydroxymethyl) phosphonium salt), and a condensate of THP with a nitrogen containing compound selected from the group consisting of urea, melamine, guanidine and dicyandiamide, and wherein the matrix substrate is a polyhydric compound which is a polyethylene glycol having a molecular weight above 600, having a melting point of between 50° and 80°C and being soluble in water at a temperature of between 5° and 100°C.

#### **PRIORITY UNDER 35 USC §119**

The Examiner's acknowledgment of the claim for foreign priority is noted, with thanks.

The Examiner also notes that none of the priority documents have been received. This is not correct. A copy of the certified copy, which was filed in the international phase of this national phase application, was forwarded by the International Bureau to the USPTO. It is located in the USPTO's electronic file for this application (sixth entry from the end in the file wrapper, with a mail room date of August 11, 2006). It is also acknowledged by the USPTO in the Notice of DO/EO Missing Requirements mailed April 2, 2007. It is thus requested that the Examiner acknowledge receipt of this copy of the certified copy.

#### **INFORMATION DISCLOSURE STATEMENT**

A First Information Disclosure Statement and accompanying papers are filed herewith. Acknowledgment is respectfully requested.

#### **OATH/DECLARATION**

The Examiner has indicated that the oath or declaration of the inventors is defective because of an error in the reference to the priority application. The declaration refers to a French application, not to a French national stage application as the Examiner has indicated; nevertheless, the Examiner is correct that a GB priority application should have been indicated. This was an obvious clerical error in the declaration, since the U.S. national stage application was clearly the national stage of PCT/GB2005/000640, which claimed the priority of a GB application, not a

FR application. See the papers originally filed herein, including the copy of the international application.

A new declaration has been prepared and executed by the inventors and is enclosed. Applicants request that the Examiner acknowledge receipt of the new inventors' declaration and confirm that it is acceptable and overcomes the record objection to a defective oath or declaration. It is noted that the new declaration refers to the application by international application number and international filing date as well as by U.S. application number and 371(c) date.

### **CLAIM REJECTIONS - 35 USC §112, SECOND PARAGRAPH**

Claims 29 and 36-40 have been rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as their invention. Applicants submit that the claims now in this application are free of this rejection.

Claim 44, the only independent claim, requires that the method use an embedded phosphonium compound in a matrix substrate made of polyethylene glycol having a molecular weight above 600 and a melting point of between 50° and 80°. The polyethylene glycol matrix is thus clearly a solid at room temperature, which indeed means that the phosphonium compound is tightly and firmly locked and attached to the surrounding matrix substrate, forming a specific embedded solid product that is utterly different from a simple mixture of a phosphonium compound and a matrix substrate or a simple absorption of the phosphonium compound onto a matrix substrate. Now that the claims require that the matrix substrate is made of polyethylene glycol having a molecular weight above 600 and a melting point of between 50° and 80°C, the substrate cannot be liquid and the phosphonium compounds cannot be solutions or mixtures or dispersions in a liquid substrate. Accordingly, the meaning of "embedded in a matrix substrate" is not ambiguous and all of the claims are clear. Withdrawal of the rejection is believed to be in order and is earnestly solicited.

**CLAIM REJECTIONS - 35 USC § 103(a)**

Claims 29-31, 35, 38 and 40-42 have been rejected under 35 USC § 103(a) as being unpatentable over Cooper et al. EP 0215562 A1 (hereafter Cooper). Applicants submit that this rejection cannot be maintained against any of the claims now in this application.

Cooper provides a biocidal mixture of an hydroxy alkyl phosphine compound of a particular type and a surfactant. The rejection based on Cooper is moot as regards the current claims. Independent claim 44 specifies use of a matrix substrate which is a particular kind of polyhydric compound, that is, a polyethylene glycol having a molecular weight above 600, having a melting point of between 50° and 80° and being soluble in water at a temperature of between 5° and 100°C, in which matrix substrate the phosphonium compound is embedded. Cooper's disclosure is extremely broad but it never hints at any possible advantage to devising a solid embedded product rather than a liquid product. All of the formulations described in Cooper's examples utilize aqueous solutions of surfactants for producing the biocides, which are also in solution form. There is no guidance provided by Cooper as to how to select a matrix substrate as specified by applicants in order to provide a solid product in which the phosphonium compound is embedded in the substrate. There is also no suggestion by Cooper that such an embedded product would be surprisingly advantageous over a liquid product. Yet applicants show in their examples that THPS, embedded in a polyethylene glycol matrix, specifically a PEG 8000 matrix, can be deployed in the presence of an oxygen scavenger without hindering the deaeration process, compared with no deaeration when a liquid biocide is employed. See Example 2. Moreover, as shown in Example 3, THPS embedded in a PEG 8000 matrix substrate has no adverse effects upon the antimicrobial performance of THPS when compared to the liquid product. This vastly improved behavior in the presence of an oxygen scavenger without hindering deaeration and without adverse effect on antimicrobial properties could not have been predicted from Cooper's teachings. The *prima facie* obviousness rejection based on Cooper is untenable and should be withdrawn.

Claim 39 has been rejected under 35 USC § 103(a) as being unpatentable over Cooper and further in view of Guritza US 6,555,228. Claim 39 has been

cancelled and has no counterpart in the claims now in this application. Therefore, this rejection has been rendered moot.

Claims 32 and 33 have been rejected under 35 USC § 103(a) over Cooper as applied to Claims 29-31, 34, 35 and 38-43, and further in view of Zakikhani EP 0451664 and by the CRC Handbook of Food Additives, pp. 433-434. It is believed that this rejection cannot be maintained against the amended claims.

To begin, Claims 34 and 43 have not been rejected above based upon Cooper alone. Moreover, Claim 34 has been amended like Claim 44 to recite the lower limit of the melting point as 50°C, which is a solid at room temperature, and Claim 43 is also so limited because of its dependency from Claim 44. Claims 34 and 43 are patentable over Cooper for at least all of the reasons set forth above as to Claim 44. This rejection thus cannot be maintained because the basic rejection based on Cooper cannot be maintained against these claims. Further, applicants' claims relate to a method of reducing the number of microorganisms or the amount of scales in an industrial system; what Zakikhani teaches for treating fabric to give it higher fire retardance is irrelevant to the instant method claims. The methods of Zakikhani and those herein are unrelated. Moreover, applicants' claims are no longer directed to the products. The CRC Handbook excerpt shows the polyhydric alcohols propylene glycol and glycerin and the polyhydric sugars sorbitol and mannitol, and Fig. 1 therein shows increasing water solubility with increasing molecular weight up to about 200. The polyhydric alcohols are shown in Table 1 of the reference to have melting points below room temperature. There is nothing in these references which suggests the present invention of reducing the number of microorganisms or the amount of scale in an industrial system using a phosphonium compound embedded in a matrix substrate which is a polyethylene glycol having a molecular weight above 600, having a melting point of between 50° and 80°C and being soluble in water at a temperature of between 5° and 100°C.

Claims 34 and 43 have been rejected under 35 USC 103(a) as being unpatentable over Cooper et al EP 0215562 and further in view of Fidoe et al. WO 99/17614 (hereafter Fidoe). This rejection cannot be maintained against these claims as amended above.

First, it is pointed out that Claims 34 and 43 are now method claims and furthermore depend from Claim 44 and are patentable over Cooper for the same reasons that Claim 44 is patentable over Cooper, as discussed fully above, particularly with reference to the showings made in the Examples of the instant application.

Moreover, Fidoe describes a solid composition comprising THP or a THP salt coated onto a solid particulate acid. The Examiner seems to equate this with the embedded product used in applicants' claims. However, the conventional production method taught on page 2, fourth paragraph, of Fidoe is not an embedding process as in applicants' invention; rather, Fidoe's process is only a spraying process where THP is absorbed onto the surface of the adipic or similar acid. Moreover, the adipic acid or similar acid is distinctly different from the polyethylene glycol matrix substrate having the molecular weight and melting point and water solubility specified in applicants' claims.

Fidoe's process typically provides a fine powder of THP-coated acid, which can be compacted into tablets. A soluble bag can be made of a water-soluble film-forming polymer such polyvinylalcohol (PVA) containing the solid, particulate, granular or pelletized THP. Fidoe's examples show that it is necessary to add a base to the THP-coated acid to increase its dissolution, but in any event Fidoe's product dissolves gradually over 24 hours time but does not give complete dissolution when no base is present. Applicants' product dissolves in less than 5 minutes as shown in Table 1 on page 7 of the specification. There is nothing in Fidoe or in Cooper together with Fidoe to suggest the presently claimed invention.

Claims 36 and 37 have been rejected under 35 USC § 103(a) as being unpatentable over Cooper as applied to Claims 29-31, 34, 35 and 38-43 above, and further in view of Heath et al. US 7,196,040 (hereafter Heath) and Kung et al. US 2003/0207270 (hereafter Kung). it is not believed that this rejection can be maintained against the claims now in this application.

First, Claims 34 and 43 have not been rejected above based upon Cooper alone. Second, Claims 34 and 43 have been amended, the language of Claim 36 has been inserted into the new independent claim, Claim 44, and Claim 37 depends

from Claim 44. Claims 36 and 37 are patentable over Cooper for at least the reasons set forth above with respect to Claim 44.

Heath teaches a hard release device made of polymeric material encapsulating active substances to provide scale inhibitors in a well. Heath teaches that many polymeric materials like polypropylene/high density polyethylene are able to deliver active substance by permeation and are not soluble. The hard capsules provided by Heath appear to be for slow release of the actives over a long period of time. The product of Example 5 provides release of the scale inhibitor at a constant low level for long periods of time (col. 10, lines 34-42 and Fig. 2). In Example 11, lines 50-67, and Figs. 6 and 7, the capsule degrades after 12-14 months at 107°C (Fig. 6) and the scale inhibitor is released at low levels over a long period (Fig. 7). In Example 12, col. 13, lines 22-23 indicate the material has been designed to degrade or slowly dissolve over 10-14 months. None of the products of Heath utilize a phosphonium compound embedded in applicants' particular matrix which readily dissolves in water in 5 minutes at 20°C (instant Example 1 and Table 1); there is also no suggestion in Heath (or in Cooper) that the phosphonium compounds embedded in applicants' matrix can be dosed into systems requiring aeration without negatively impacting the performance of oxygen scavengers and without negatively affecting the phosphonium compound's biocidal properties (instant Examples and Table 1).

Kung relates to identifying the characteristics of herbal medicines, including gene expression profiles. This is non-analogous art. One of ordinary skill in developing methods of reducing the number of microorganisms or the amount of scale in an industrial system by contacting it with a phosphonium compound would not look to a document about gene expression profiles and identifying the characteristics of herbal medicines for guidance. Kung has nothing to do with reducing numbers of microorganisms or the amount of scale; Kung has nothing to do with phosphonium compounds. Moreover, on page 37, Kung describes using polyethylene glycol 8000 as part of a 5 ml mixture containing enzymes and bovine serum albumin to incubate a filter membrane. This is not analogous to the instant system and in no way suggests embedding a phosphonium compound as defined in Claim 44 in a polyethylene glycol matrix substrate having the properties specified in Claim 44 (molecules weight above 600, melting point of between 50° and 80°C,

soluble in water at a temperature of between 5° and 100°C) for use herein, which lead to a combination of results which was not predictable: (1) solubility of phosphonium compound embedded in polyethylene glycol matrix substrate at low temperature in approximately 5 minutes for quick release of the antimicrobial activity of the embedded phosphonium bioride; (2) ability to be deployed in the presence of an oxygen scavenger without hindering the deaeration process; and (3) no loss of biocidal performance. These advantages are clearly shown by the Examples in the as-filed specification.

Neither Heath nor Cooper suggest applicants' invention. Cooper shows that biocidal effectiveness can be improved over THPS-75 alone by using Cooper's formulation 1, which is 1 part by weight "EMPIGEN"® BAC, BAC being a 50% aqueous solution of alkylbenzylammonium chlorides with THPS-75 (a 75% aqueous solution of tetrakis(hydroxymethyl)phosphonium sulfate). See Examples 1-3 of Cooper. Cooper does not describe any specific solid formulations or suggest that such formulations would have advantageous properties. Heath describes formulations which provide slow release over long periods of time. A combination of the two would encapsulate Cooper's formulation in a hard plastic capsule so that it would release biocide gradually over a long period of time. This is not what applicants have done, since applicants' method uses phosphonium compound embedded in a particular matrix which dissolves in about 5 minutes, yet is shown in the specification to have advantages over a liquid product in that it can be deployed in the presence of an oxygen scavenger without hindering the deaeration process without detrimental effect on biocidal effectiveness.

Neither Cooper nor Heath suggests the method claimed herein. The citation of Kraus to purportedly fill the gap in the prior art of Cooper and Heath does not make the present invention obvious. Kraus is non-analogous art and its citation is clearly contrary to the sound scientific reasoning of one of ordinary skill. It is quite clear that the Examiner has picked and chosen from Kraus only so much as might relate to use of polyethylene glycol 8000 for anything, to the exclusion of what Kraus teaches as a whole, which is indeed irrelevant and unrelated to the present invention. Withdrawal of this rejection is believed to be in order.



In view of the foregoing, it is believed that all record rejections and objections have been overcome. Further, favorable action in the form of a Notice of Allowance is believed to be next in order and is earnestly solicited.

Respectfully submitted,

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Date: December 8, 2009

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